

## MOUNTING PLATE FOR VEHICLE DOOR REINFORCEMENT MEMBERS

### REFERENCE TO RELATED APPLICATIONS

- [1] This application claims priority to French Patent Application FR 02 14 110 filed November 12, 2002.

### TECHNICAL FIELD

- [2] This invention relates generally to a mounting plate that fixes a reinforcement member in different orientations in a vehicle door to protect vehicle occupants from a side impact.

### BACKGROUND OF THE INVENTION

- [3] Vehicle doors are fitted with assemblies that reinforce the structure of the door against side impacts. United States Patent No. 6,135,537 discloses a reinforced vehicle door assembly that transfers the energy of a side impact to the chassis of a vehicle through the door hinge. The assembly includes two anti-intrusion bars across the door. One end of the bar is connected to the hinge, and the other end of the bar is connected to the door frame by a mounting plate.

- [4] One drawback to this assembly is that the two ends of the anti-intrusion bars are fixed by different components.

- [5] Thus, there is a need to simplify the production of the mounting component for anti-intrusion reinforcement members in vehicle doors.

### SUMMARY OF THE INVENTION

- [6] The present invention is directed to a mounting plate for an anti-intrusion reinforcement member. The mounting plates includes securing features that secure the plate to a vehicle door and a plurality of mounting interfaces for the reinforcement member. A door hinge can also be fixed to the mounting plate.

- [7] In one embodiment, the mounting interfaces have different orientations. The interfaces can also be channels that are inclined relative to each other.

- [8] The present invention also provides an anti-intrusion assembly including the reinforcement member and the mounting plate, a door including the assembly, or a vehicle including a plurality of doors. The assembly can include two mounting plates. In one example, one of the doors is a front door and another is a rear door.
- [9] These and other features of the present invention will be best understood from the following specification and drawings.

#### **BRIEF DESCRIPTION OF THE DRAWING**

- [10] Other characteristics and advantages of the invention are given in the following detailed description of the embodiments of the invention, given by way of example only and with reference to the drawing.
- [11] Figure 1 shows a mounting plate according to one embodiment of the present invention.

#### **DETAILED DESCRIPTION OF PREFERRED EMBODIMENT**

- [12] Figure 1 illustrates the anti-intrusion reinforcement member mounting plate 10 of the present invention. The plate 10 includes securing features 22, 24 to secure the plate 10 to a vehicle door. The plate 10 also includes a plurality of reinforcement member mounting interfaces 12, 14 for a reinforcement member 16, allowing one type of plate 10 to be fitted to different fixing points in the door and to different reinforcement members 16. Regardless of the position of the reinforcement members 16 in the door, the reinforcement members 16 can be fixed to the door with the plate 10, simplifying production of the mounting interfaces 12, 14. The plate 10 can also be fitted to different types of doors, depending on the door length.

- [13] The reinforcement member 16 is fixed to a vehicle door panel 9 using the plate 10. In one example, the panel 9 is an inner door panel joined to an outer panel (not shown) to form the door.

- [14] Vehicle doors are being made increasingly lighter by reducing the thickness of the bodywork and by decreasing the size of the door structure. A drawback to making doors lighter is that the impact resistance of the door decreases. The reinforcement member 16 lines the door, increasing the door strength and providing greater resistance than the

bodywork in the event of an impact. The reinforcing member 16 extends in a zone of the door that could potentially injure the vehicle's occupants in the event of a side impact. The reinforcing member 16 reinforces the door without adding excessive bulk or weight to protect the vehicle's occupants and limit the intrusion of the door into the vehicle passenger compartment in the event of a side impact.

[15] The reinforcement member 16 extends across the longitudinal direction of the vehicle from one side of the door to the other. The longitudinal reinforcement member 16 may extend approximately in the longitudinal direction of the vehicle and level with the occupants' pelvises. Alternately, the reinforcement member 16 can be inclined relative to the longitudinal direction to cover different impact heights in the door.

[16] The reinforcement member 16 also has flexural strength. The reinforcement member 16 is a section where the highest inertia is in a side impact direction. In one example, the reinforcement member 16 is a beam having a circular cross-section. Preferably, the reinforcement member 16 is made of metal. The reinforcement member 16 is less bulky and simple to produce.

[17] The securing features 22, 24 fix the reinforcement members 16 to the vehicle door 9. The securing features 22, 24 include a mounting plate 22. Preferably, the mounting plate 22 is integral with the mounting interfaces 12, 14, facilitating production of the mounting plate 22. The shape of the mounting plate 22 depends on the mounting point of the mounting plate 22 to the door 9.

[18] The mounting plate 22 is fixed to a ridge on the door panel 9. The mounting plate 22 has a U-shaped cross-section that follows the shape of the ridge on the door panel 9. The securing features 22, 24 also include securing devices 24 to fix the mounting plate 22 to the door panel 9. In one example, the securing devices 24 are bolts. However, it is to be understood that other fixing methods, such as welding, can be utilized.

[19] The mounting plate 22 may be a reinforcing plate for a hinge 26 on the door. The reinforcing member 16 can be secured to the vehicle chassis by fixing the hinge 26 to the mounting plate 22, improving the safety of the vehicle occupants by limiting intrusion of the reinforcement members 16 into the passenger compartment in the event of a side impact.

[20] The mounting interfaces 12, 14 fix the reinforcement member 16 to the door 9 and provide the link between the reinforcement members 16 and the door 9. The mounting interfaces 12, 14 receive and immobilize the reinforcement member 16. In one example, the reinforcing member 16 is secured to the mounting interfaces 12, 14 by welding. However, it is to be understood that the reinforcing member 16 can be secured to the interfaces 12, 14 by any method.

[21] Preferably, the mounting interfaces 12, 14 have different orientations. In one example, the mounting interfaces 12, 14 extend along the longitudinal axes 18, 20, respectively. The axes 18 and 20 have different orientations and are inclined relative to each other. Therefore, the plate 10 can be fixed to different points on the door 9, and the reinforcement member 16 can be fixed to one of the mounting interfaces 12, 14. That is, one type of plate 10 can provide several reinforcement member mounting positions.

[22] The different orientations of the longitudinal axes 18, 20 allow the reinforcement members 16 to be inclined to a greater or lesser extent relative to the longitudinal direction of the vehicle. If the reinforcement member 16 is inclined a great deal relative to the longitudinal direction of the vehicle, it may be approximately diagonal to the part of the door 9 located underneath the window. If the reinforcing member 16 is only slightly inclined relative to the longitudinal direction of the vehicle, the reinforcement member 16 is placed level with the pelvises of the vehicle's occupants.

[23] In one embodiment, the mounting interfaces 12, 14 are channels having the longitudinal axis 18, 20, respectively. The channels have an elongated shape in this example to allow insertion of the reinforcement member 16. The channels 12,14 are utilized to immobilize the reinforcement member 16 perpendicular to its longitudinal axis 18, 20, respectively, improving the fixing of the reinforcement member 16 to the door 9. The reinforcement member 16 may also be immobilized in the other directions by welding. The longitudinal axes 18 and 20 are inclined relative to each other so that they can retain the reinforcement members 16 in different orientations. If the reinforcement member 16 is a beam having a circular cross-section, the channels 12,14 can have a rounded bottom to improve retention of the reinforcement member 16.

[24] The present invention also relates to an assembly including an anti-intrusion reinforcement member 16 and a reinforcement member mounting plate 10. The assembly

can be fitted in several positions in the door 9 because it has a plurality of mounting interfaces 12, 14. The assembly can also include several mounting plates 10. For example, a reinforcement member 16 having a longitudinal shape may be fixed at each end to the door by a plate 10. The same type of plate 10 may be used for mounting the reinforcement member 16 because the plates 10 have several interfaces 12, 14, reducing the number of types of plates 10 to be produced.

[25] The invention also relates to a door 9 including the assembly described above. The advantages described above also apply to the door 9. Moreover, the door 9 may have a plurality of assemblies that arrange the reinforcement members 16 in different directions and at different heights to increase protection of the vehicle's occupants. The different assemblies advantageously use the same type of plate 10 for mounting the different reinforcement members 16, and the same plate 10 can be used at different reinforcement member 16 fixing points. The plate 10 is compatible with the different orientations of the reinforcement members 16 in the door 9.

[26] The invention also relates to a vehicle including a door 9 as described above. The advantages described above also apply to the vehicle itself. Moreover, the vehicle may have a plurality of doors 9 containing the assembly. For example, one door is a front door and another door is a rear door. The doors may not have the same dimension in the longitudinal direction of the vehicle, which may influence the orientation of reinforcement members 16 in the doors. In this case, the plate 10 is used to adapt to these different orientations. The plate 10 allows the reinforcement members 16 to be fixed equally successfully in the front and the rear doors. Therefore, only one type of plate 10 can be produced for a vehicle, simplifying the production of the vehicle.

[27] Of course, this invention is not limited to the embodiments described by way of example. Thus, the number of interfaces on a plate 10 is not limited to the two shown in Figure 1. Moreover, the invention also applies to three-door vehicles, as the plate 10 can be fixed in the vehicle bodywork level with the rear passengers.

[28] The foregoing description is only exemplary of the principles of the invention. Many modifications and variations of the present invention are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed, however, so that one of ordinary skill in the art would recognize that certain

modifications would come within the scope of this invention. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described. For that reason the following claims should be studied to determine the true scope and content of this invention.